

## ORIGINAL ARTICLE

# Proposal of the *Caryanda amplexicerca*-species group (Orthoptera: Acridoidea) with description of two new species from China

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**Abstract** Two new species, *Caryanda cyanonota* **sp. nov.** and *C. shuangjianga* **sp. nov.** are described and illustrated. The male genitalia of *C. amplexicerca* Ou, Liu & Zheng, 2007 is complementally described. A new species group of *Caryanda amplexicerca*-species group is proposed to contain the above three allied species. A key to the species group is provided. Type specimens are deposited in the Biological Science Museum, Dali University (BMDU), Yunnan Province, China.

**Key words** Caryandinae, Acrididae, *Caryanda*, new species.

## 1 Introduction

The genus *Caryanda* Stål, 1878 was established with *Acridium spurium* Stål, 1860 as type species. So far, about 76 species were reported under the genus in the world, of which 62 species were recorded in China and 21 species in Yunnan (Eades *et al.*, 2015; He *et al.*, 1999; Li & Xia, 2006; Mao *et al.*, 2011). However, the phylogenetic relationships among them have been entirely unclear for a long time. To clarify the relationships among them, species group dividing is necessary.

In this paper, two new species are founded from Yunnan, namely *C. cyanonota* **sp. nov.** and *C. shuangjianga* **sp. nov.**, are extremely similar to *C. amplexicerca* Ou, Liu & Zheng, 2007 in general features, especially in the incurved male cerci and the upcurved apical penis valves which have distally widened shaped like a reversed trapezoid. Therefore, we proposed in this paper the conception of *Caryanda amplexicerca*-species group to contain the three extremely allied species in the genus *Caryanda*.

## 2 Materials and methods

All specimens examined are deposited in the Biological Science Museum, Dali University (BMDU) and Faculty of Conservation Biology, Southwest Forestry University (SFU), Yunnan Province, China. In this paper, we adopt the Vickery's classification system (1997), follow the methods of Ingrisch (1989). The main terminology follows Dirsh (1975). The color figures (Figs 1–5) are photographed by a digital camera (Canon EOS 60D). The line drawings, figures (Figs 6–21), are made with a stereomicroscope (Olympus SZX7) equipped with drawing apparatus, and post-corrected with

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Adobe Photoshop® CS2 software.

### 3 Taxonomy

#### *Caryanda* Stål, 1878

*Caryanda* Stål, 1878: 47. Type-species: *Acridium (Oxya) spurium* Stål, 1860.

*Dibastica* Giglio-Tos, 1907: 9; Hollis, 1975: 217 (junior synonym of *Caryanda*).

*Austenia* Ramme, 1929: 331 (nomen preoccupatum, nec Nevill, 1878); Hollis, 1975: 217 (junior synonym of *Caryanda*).

*Austeniella* Ramme, 1931: 934 (replacement name for *Austenia*); Hollis, 1975: 217 (junior synonym of *Caryanda*).

*Tzacris* Tinkham, 1940: 313; Li, Xia, *et al.* 2006: 103 (junior synonym of *Caryanda*).

*Sinocaryanda* Mao & Ren, 2007: 366; Mao, Ren & Ou, 2011: 60, 296 (junior synonym of *Caryanda*).

Generic diagnosis. Body small sized. Pronotum with posterior margin incised in middle; median carina weakly indicated; lateral carina absent. Tegmina scale-like, laterally situated. Hind femora with lower genicular lobes spined. Hind tibiae cylindrical, not expanded in apical half, external apical spines present. In male, furculae horizontally present or rarely absent on hind margin of 10<sup>th</sup> abdominal tergite; subgenital plate moderately conical.

Distribution. Oriental (China, Burma, India, Indonesia, Philippines, Sri Lanka, Thailand, Vietnam), Australasian (New Guinea), Ethiopian (Congo, Sierra Leone) Regions.

#### *Caryanda amplexicerca*- species group

Diagnosis. The *amplexicerca*- species group shares the following diagnostic characters: male cerci compressed and triangular in lateral view, incurved and clasping-shaped in dorsal view; epiphallus with lophi nearly trapeziform; phallic complex with upcurved apical penis valves, distally widened gradually, reversedly trapeziform in lateral view, lamellate in apical view.

This species group is endemic to Yunnan with three species so far.

#### Key to the male of *Caryanda amplexicerca*- species group.

1. Body bluish in dorsal, with a black triangular macula on head ..... *C. cyanonota* sp. nov.  
Body green in dorsal, without any macula on head ..... 2
2. Hind femora red except basal about 1/10 yellow, with a yellow preapical ring; supra-anal plate nearly quadrate ..... *C. amplexicerca*  
Hind femora yellow except apical 2/5 red, without preapical ring; supra-anal plate nearly semicircular ..... *C. shuangjianga* sp. nov.

#### *Caryanda amplexicerca* Ou, Liu & Zheng, 2007 (Figs 1–2, 6–10)

*Caryanda amplexicerca* Ou, Liu & Zheng, 2007: 758–762; Mao, Ren & Ou, 2011: 75.

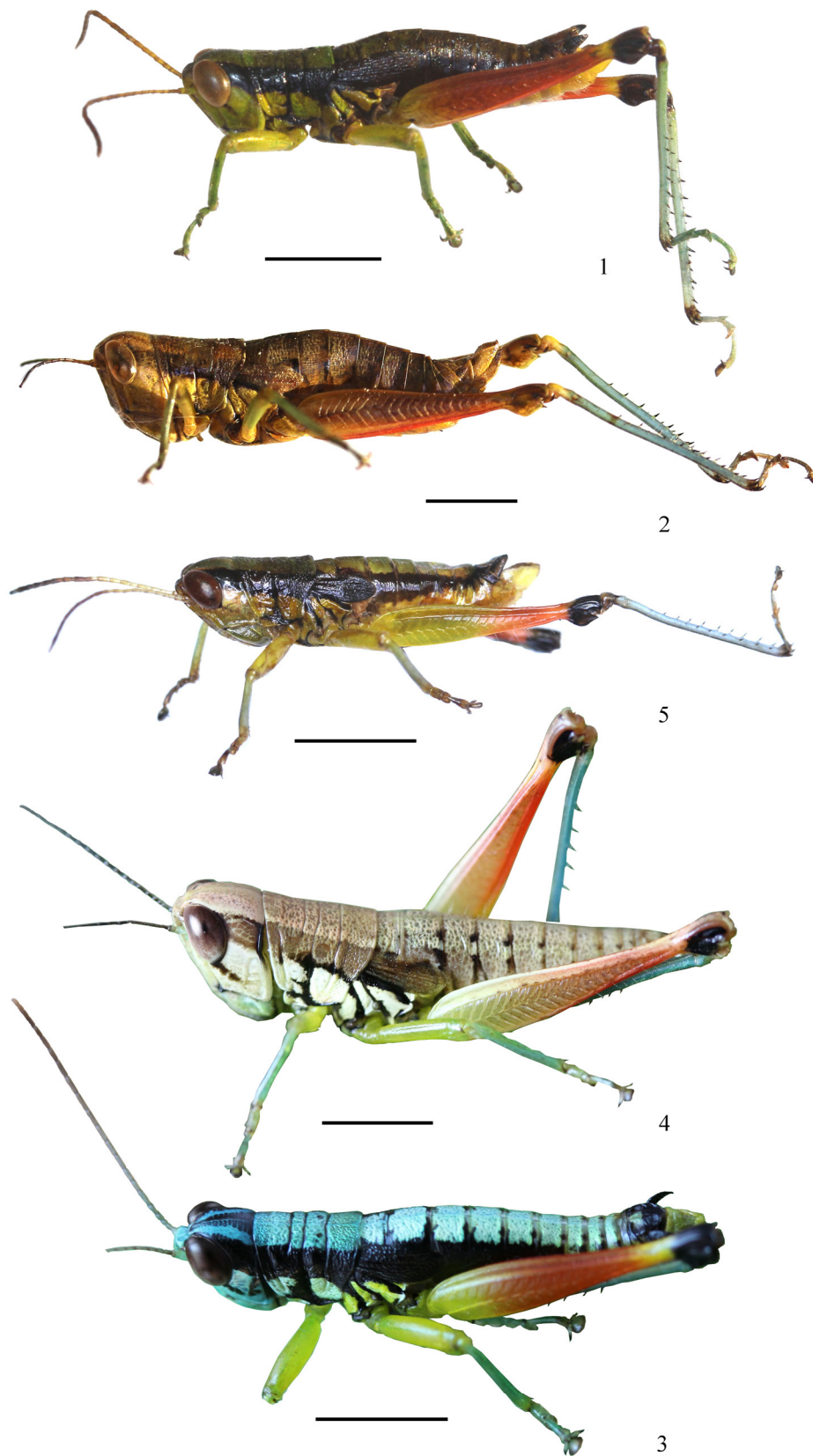
Description. Epiphallus with lophi trapeziform, pointing dorsad, base narrower than top, apical outer angles obtuse; anchorae large, triangular; anterior projections with posterior sides faintly backward bulging in lateral view; bridge divided in middle. Phallic complex with cingular valves almost shielded by apical valves of penis, fused apically; apical penis valves upcurved, distally widened shaped like a reversed trapezoid and with an impression at preapical area in lateral view, lamellated in apical view.

Material examined. Paratypes. 1♂, 1♀, China, Yunnan, Gejiu, Kafang, 3 September 2006, leg. Qing Liu, deposited in SFU. Other material examined. 18♂, 19♀, China, Yunnan, Gejiu, Kafang (23°15'N, 103°09'E; elev. 1 709 m), 30 September 2009, leg. Ben-Yong Mao, deposited in BMDU.

Distribution. China (Yunnan).

Biology. *C. amplexicerca* is very common in grasslands on mountain slope from Gejiu, Yunnan Province and has been observed feeding *Oplismenus compositus* in field.

Remarks. The male genitalia of *C. amplexicerca* Ou, Liu & Zheng, 2007 was not described formerly, and is described here.



Figs 1–5. Habitus of adults, lateral view. 1–2. *Caryanda amplexicerca* Ou, Liu & Zheng, 2007, ♂, ♀, paratypes. 3–4. *C. cyanonota* sp. nov., ♂, ♀. 5. *C. shuangjianga* sp. nov., ♂. Scale bars = 5 mm.

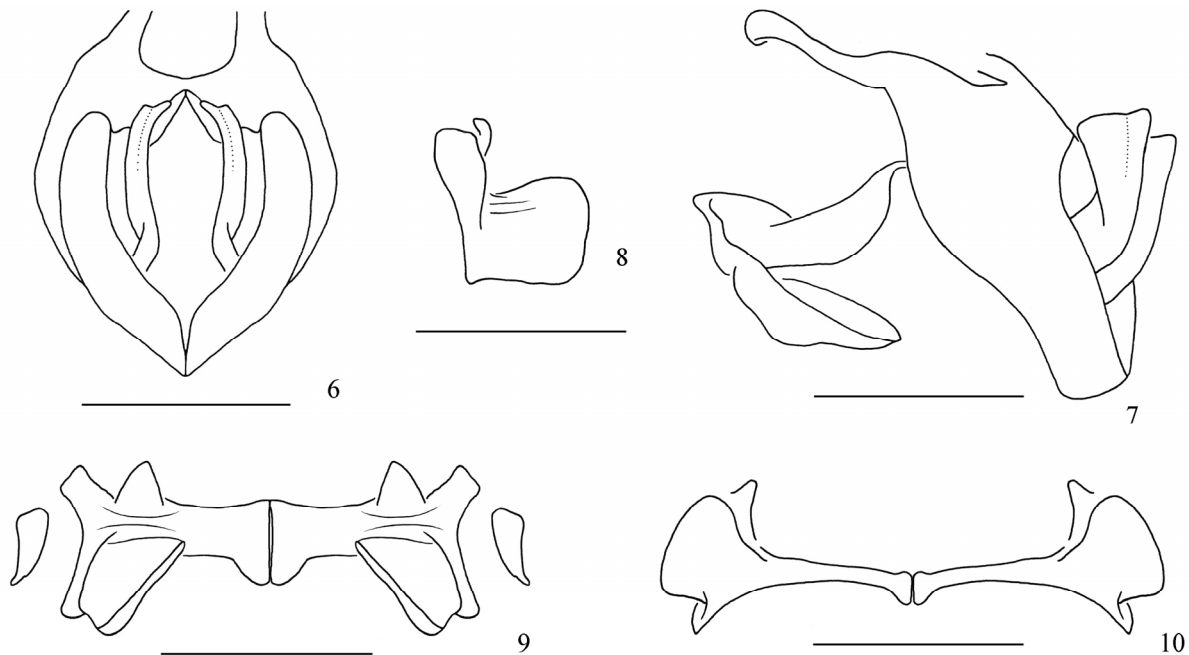
*Caryanda cyanonota* sp. nov. (Figs 3–4, 11–19)

Diagnosis. This new species is similar to *C. amplexicerca* and *C. shuangjianga* sp. nov., but differs from the latter two by the characters listed in Table 1.

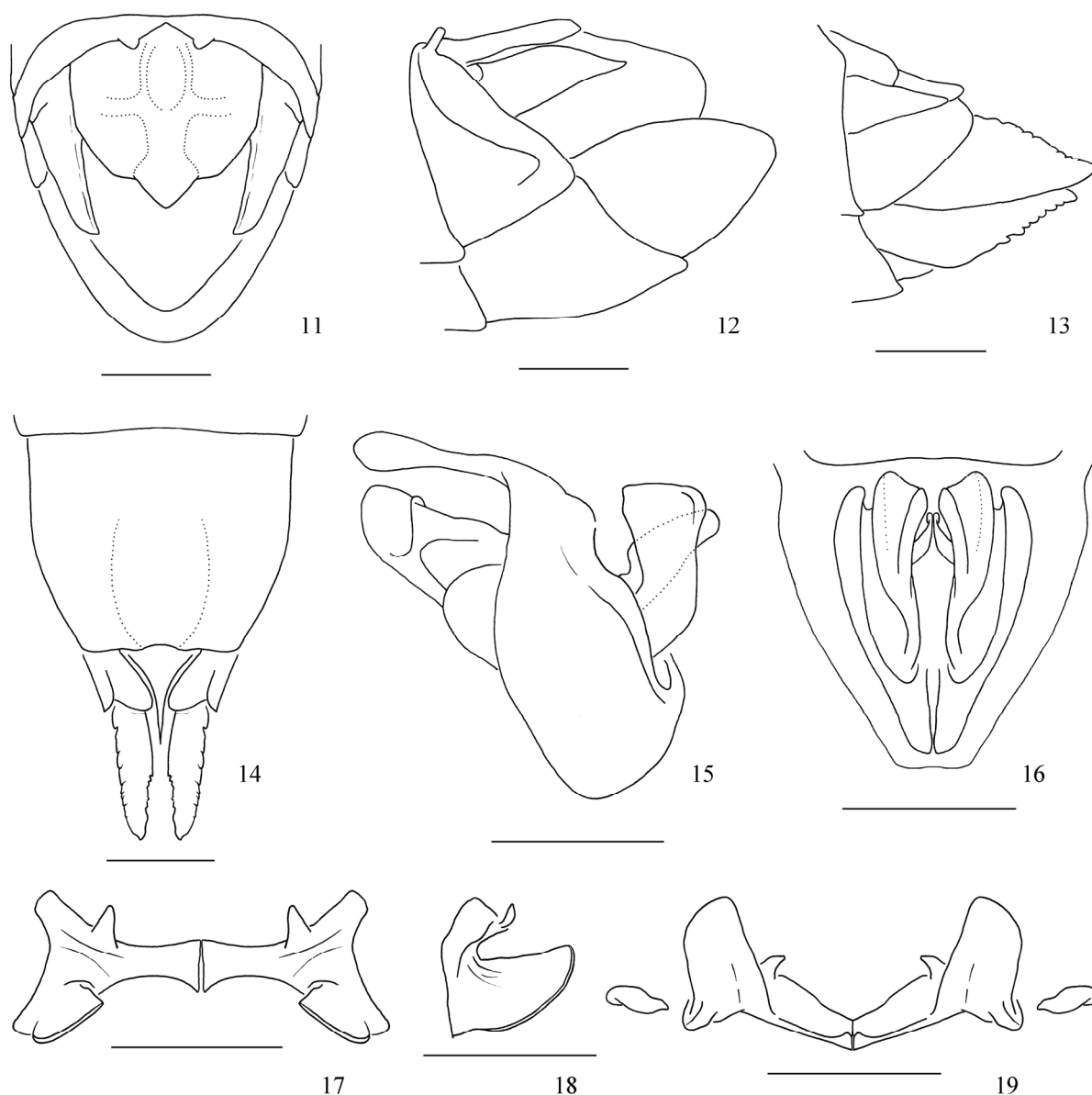
**Table 1.** Comparison among *Caryanda amplexicerca*, *C. cyanonota* sp. nov. and *C. shuangjianga* sp. nov.

Characters	<i>C. amplexicerca</i>	<i>C. cyanonota</i> sp. nov.	<i>C. shuangjianga</i> sp. nov.
Male supra-anal plate	Quadrate, wider fairly than long, apex rounded	Quadrate, wider fairly than long, apex rectangular	Semicircular, wider strongly than long, apex obtusely angular
Lophi of epiphallus	Base narrower than top	Base broader than top	Base as broad as top
Coloration of male	Green in dorsal; hind femora red except basal about tenth yellow, with a yellow preapical ring	Blueish in dorsal; hind femora red except basal about fourth yellow, with a yellow preapical ring	Green in dorsal; hind femora yellow except apical about two fifths red, without preapical ring

Description. Body small-sized. Head shorter than pronotum. Fastigium broad, width in front of eyes larger than length. Face sloping; frontal ridge laterally straight with shallow-longitudinal sulcus, lateral margins nearly parallel except somewhat extended around median ocellus. Lateral facial keels thick and straight. Antennae filiform, just reaching coxa of hind leg (♂) or approaching posterior margin of pronotum (♀), median segments about 3.1–3.5 (♂) or 2.2–2.6 (♀) times longer than wide. Eyes oval, longitudinal diameter about 1.4–1.5 (♂) or 1.5 (♀) times as long as horizontal diameter, and about 2.2–2.5 (♂) or 2.0–2.2 (♀) times as long as subocular furrow. Pronotum nearly cylindrical, surface foveolate, anterior margin nearly straight, posterior margin moderately (♂) or slightly (♀) concave; median carina indistinct, lateral carinae absent; three transverse sulci distinct; prozona 2.2–2.4 (♂) or 2.1 (♀) times as long as metazona; lateral lobe with posteroventral corner obtus. Prosternal spine conical, apex acute. Mesosternal interspace about 1.5–1.6 (♂) or 1.1–1.3 (♀) times as long as minimum width; metasternal lobes almost contiguous (♂) or separated (♀). Tegmina narrow scale-like, 2.4–2.9 (♂) or 2.7–2.8 (♀) times as long as maximum width, apex reaching at or just surpassing beyond posterior margin of 1<sup>st</sup> abdominal tergite in both sexes. Hind femora with upper carina smooth and terminating in an acute angle; lower



Figs 6–10. *Caryanda amplexicerca* Ou, Liu & Zheng, 2007. 6–7. Phallic complex, apical and lateral views. 8–10. Epiphallus, lateral, dorsal and posterior views. Scale bars = 1 mm.



Figs 11–19. *Caryanda cyanonota* **sp. nov.** 11–12. Terminalia, ♂, dorsal and lateral views. 13–14. Abdominal apex, ♀, lateral and ventral views. 15–16. Phallic complex, lateral and apical views. 17–19. Epiphallus, dorsal, lateral and posterior views. Scale bars = 1 mm.

genicular lobes spined. Hind tibiae with apical half nearly cylindrical, with 6–7 external and 8–9 internal spines on dorsal side (not including a small external apical spine). Tympanum opened distinctly, oval.

In male, tenth abdominal tergite narrowly divided in middle but contiguous at base, with small furculae on posterior margin. Supra-anal plate nearly quadrate, maximum width 1.1 times as length; basal half with broad median longitudinal sulcus, lateral areas little concaved; lateral margins arched, weakly risen at basal half; posterior margin straight on both sides, triangular in middle, apex rectangular. Cerci compressed, gradually narrowing apically, long triangular in lateral view, incurved in dorsal view, apex acute. Epiphallus with lophi trapeziform in lateral view, pointing dorsad, base broader than top, apical outer angle arched; anchorae small, dactyloid; anterior projections with upper margins dorsad strongly bulging in lateral view; bridge divided in middle. Phallic complex with cingular valves mostly shielded by apical valves of penis, leaving only apex; apical penis valves upcurved, distally widened and shaped like a reversed trapezoid in lateral view, apex lamellated in apical view.

In female, cerci conical; subgenital plate with a median concavity in posterior half, posterior margin nearly straight at both sides and with a shallow concave in middle; ventral basivalvular sclerite with inner margins hardly contiguous with each other; ovipositor valves unevenly serrated along margins.

Coloration. Male. Head blue, with a triangular black spot on dorsum; postocular bands black, continued on dorsal area of lateral lobes of pronotum, tegmina and 10th abdominal tergite. Eyes brown. Antennae with basal segments grey, others black. Pronotum blue except three transverse sulci black in dorsal; lateral lobe with two yellowish white maculae on midio-area, inferior margin black. Tegmina black. Fore and middle legs yellow except tibiae and tarsi bluish green. Hind femora red except basal about fourth yellow, with a yellow preapical ring, knee black; hind tibiae basal tenth black, others blue; hind tarsi bluish, claws with apical half black. Mesothorax and metathorax respectively with two yellow spots in episterna and epimera. Abdominal tergites blue in dorsal, lateral lobes yellow in ventral areas; abdominal sternites and terminalia yellow. Cerci black. Supra-anal plate black in apical half.

Female light brown. Head light brown except frons and genae yellowish white; postocular bands brown. Eyes brown. Antennae brown. Pronotum light brown in dorsal, lateral lobes with midio-areas yellowish white, inferior margins black. Tegmina brown. Fore and middle legs green yellow. Hind femora brownish red, but basal about two fifths green yellow, knee black; hind tibiae and tarsi bluish, claws black in apical half. Abdomen light brown.

Measurements (mm). Body ♂ 18.8–20.7, ♀ 26.0–27.0; pronotum ♂ 3.5–3.8, ♀ 5.2–5.5; tegmen ♂ 3.1–3.2, ♀ 3.7–4.3; hind femur ♂ 10.7–11.5, ♀ 13.8–15.0.

Material examined. Holotype ♂, China, Yunnan, Ximeng (22°38'N, 99°35'E; elev. 1118 m), 1 November 2012, leg. Ben-Yong Mao and Miao Li. Paratypes: 16♂, 8♀, same data as holotype, deposited in BMDU.

Etymology. The specific epithet is derived from the Latin “*cyano-*” and “*notum*”, referring to the dorsum of male body being blueish.

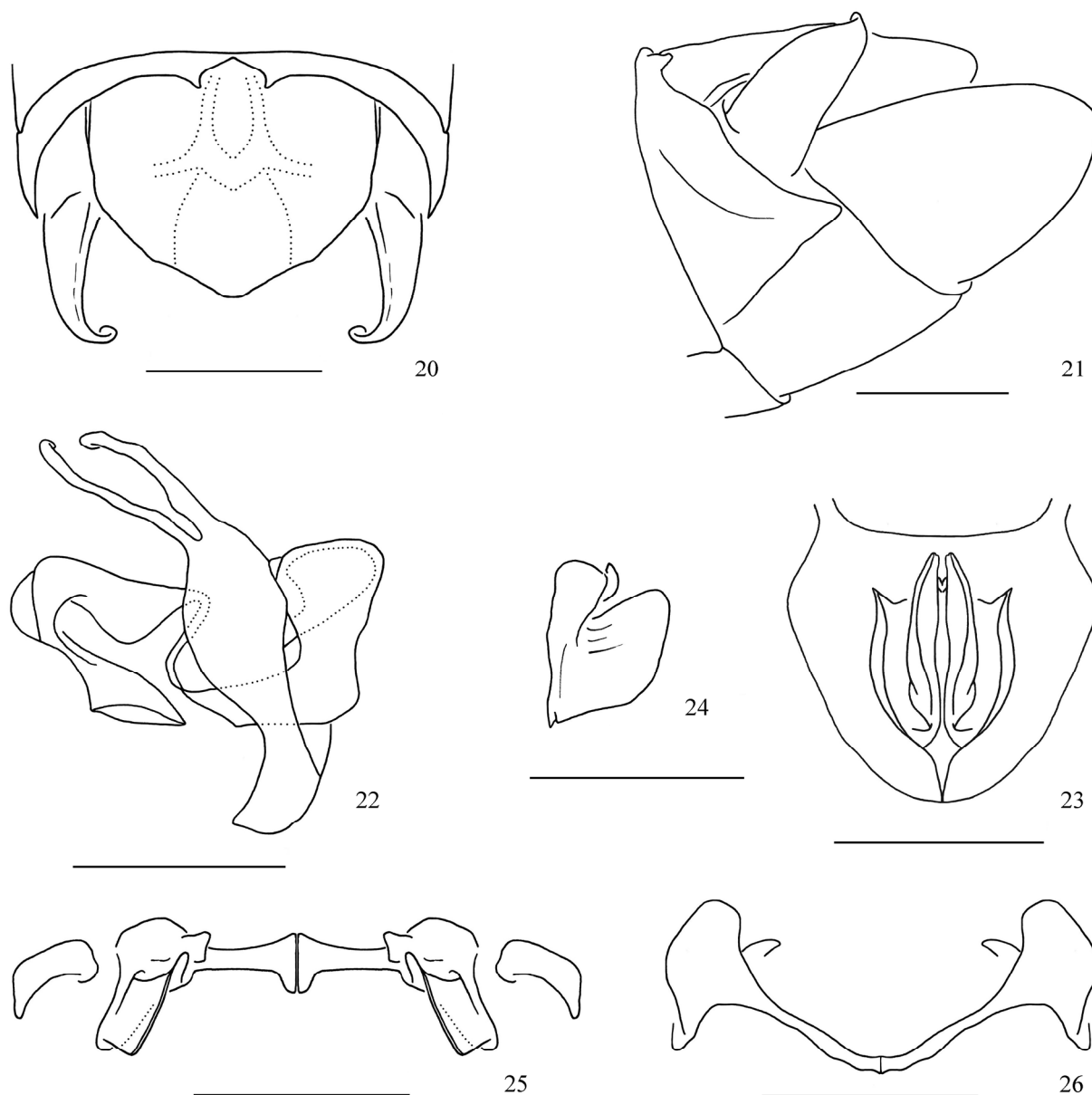
Distribution. China (Yunnan).

Biology. *C. cyanonota* **sp. nov.** lives on the leaves of some Gramineae tussock grasses under south subtropical broad-leaf shrub, which grows in the wet and half shady zone at medium elevation (1100 m) in Yunnan. The food plant of this species have not been definitely determined in field, but in laboratory, it appears to feed on some grass, such as *Arthraxon hispidus*, *Oplismenus compositus* and *Echinochloa crusgalli*.

### *Caryanda shuangjinga* **sp. nov.** (Figs 5, 20–26)

Diagnosis. This new species is similar to *C. amplexicerca* and *C. cyanonota* **sp. nov.**, but differs from the latter two by the characters listed in Table 1.

Description. Male. Body small-sized. Head shorter than pronotum. Fastigium broad, width in front of eyes larger than length. Face sloping; frontal ridge straight in lateral view, longitudinally sulcated, lateral margins nearly parallel except faintly extended around median ocellus. Lateral facial keels thick and straight. Antennae filiform, just reaching coxa of hind leg, median segments about 2.3 times longer than wide. Eyes oval, longitudinal diameter about 1.5 times as long as horizontal diameter, and about 2.4 times as long as subocular furrow. Pronotum nearly cylindrical, surface foveolate, anterior margin nearly straight, posterior margin distinctly concave; median carina faint, lateral carinae absent; three transverse sulci distinct; prozona 2.6 times as long as metazona; posteroventral corner of lateral lobe obtus. Prosternal spine conical, apex blunt. Mesosternal interspace about 1.8 times longer than minimum width; metasternal lobes almost contiguous. Tegmina narrow scale-like, 2.5 times as long as maximum width, apex just surpassing beyond posterior margin of 1<sup>st</sup> abdominal tergite. Hind femora with lower genicular lobes spined. Hind tibiae with apical half nearly cylindrical, with 7 external and 9 internal spines on dorsal side (not including a small external apical spine). Tympanum opened distinctly, oval. Tenth abdominal tergite narrowly divided but contiguous at very base in middle, with small furculae on posterior margin. Supra-anal plate nearly semicircular, maximum width 1.3 times as length; basal third with a broad median longitudinal sulcus, lateral areas concaved; lateral margins weakly risen; posterior margin triangularly protrudent, apex obtusely angular. Cerci strongly compressed, long triangular in lateral view, strongly incurved, apex obtuse and entad rolled. Epiphallus with lophi trapeziform in lateral view, pointing dorso-anteriorly, base as broad as top, apical outer angle nearly rounded; anchorae small, triangular; anterior projections with upper margins dorsad strongly bulging in lateral view; bridge divided in middle. Phallic complex with cingular valves entirely shielded by apical valves of penis; apical penis valves upcurved, distally widened as a reversed trapezoid in lateral view, apex lamellated in apical view.



Figs 20–26. *Caryanda shuangjinga* **sp. nov.** 20–21. Terminalia, ♂, dorsal and lateral views. 22–23. Phallic complex, lateral and apical views. 24–26. Epiphallus, lateral, dorsal and posterior views. Scale bars = 1 mm.

**Coloration.** Male. Body green in dorsal. Head green except frons and gena greenish yellow; postocular bands black, continued on dorsal area of lateral lobes of pronotum, tegmina and 10th abdominal tergite. Eyes brown. Antennae with basal segments yellow, others black. Pronotum green in dorsal; lateral lobe yellow below postocular bands but median transverse sulcus and inferior margin black. Tegmina black. Fore and middle legs greenish yellow. Hind femora yellow except apical about two fifths red, knee black; hind tibiae blue, with a dark spot at base. Mesothorax and metathorax respectively with two yellow spots on episterna and epimera. Abdominal tergites green, with lateral lobes yellow on ventral areas; abdominal sternites yellow. Cerci and furculae black. Supra-anal plate mostly black.

Female. Unknown.

**Measurements (mm).** Body ♂ 18.0; pronotum ♂ 3.5; tegmen ♂ 2.8; hind femur ♂ 9.8.

**Material examined.** Holotype ♂, China, Yunnan, Shuangjiang (23°27'N, 99°58'E; elev. 2190m), 12 August 2010, leg. Ben-Yong Mao, deposited in BMDU.

**Etymology.** The specific epithet refers to the type locality, Shuangjiang County, Yunnan Province, China.

**Distribution.** China (Yunnan).

**Biology.** The species is infrequent in some grasses surrounding maize fields. Its preferred food plants remain still unknown.

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